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Subantarctic vegetation.—Of the several antarctic regions whose vegetation has been recently studied, South Georgia seems of particular interest, both because of its isolation and on account of the character of its vegetation, being transitional between the truly antarctic type and the well developed subantarctic associations found in such regions as the Falkland Islands. As a result of visits to the island in 1902 and in 1909, SKOTTSBERG[21] gives an interesting account of the plant associations. The island is mountainous, some peaks reaching 2000 m., and is largely covered with ice in the form of glaciers moving down the valleys and reaching the sea in fiords. There is little seasonal difference in climate, the summer mean temperature being about 4° C., and the winter about $-1°$ C. Exposure is a factor of prime importance in determining the distribution of the vegetation. Only 15 species of seed plants and three ferns are found upon the island, but the moss and lichen floras are comparatively rich, with 99 and 58 species respectively, of which 46 and 24 respectively are endemic.

The principal plant associations are the tundra, the swamp and the tussock grass. The tundra has by far the most extensive development, showing all transitional forms from one rich in grasses to the moss-lichen carpet. The swampy places are dominated by Juncaceae, while the halophilous *Poa flabellata* tussock-grass association fringes the beach. It is often almost pure, the tussocks attaining a height of 1.5 m., with an equally great diameter. This association was formerly more widespread and equally important in the Falkland Islands,[22] but has been disturbed and largely destroyed by the introduction of sheep.

These islands have a comparatively mild climate of insular type. The summer mean temperature is 10° C., the winter mean 2°5 C., affording a fairly well marked periodicity, especially in the flowering of the seed plants, although the 73 cm. of precipitation are very evenly distributed. In portions of the islands there is little snow, and the soil is never frozen hard, but, apparently because of very high winds, there are no trees. Nevertheless, 47 of the 162 species of vascular plants are evergreen. The possible land connection with the mainland during the Tertiary may account for 82 per cent of the species being Magellan plants; 15 species are endemic. SKOTTSBERG decides that the vegetation, because of its close peat-forming character, is really a heath, exhibiting many characters in common with the heaths of northern Europe, and particularly with that of Faeröes, although with grasses forming a more conspicuous element. The most widespread association is that dominated by *Cortaderia* and other grasses, largely of tussock habit. It seems to occupy much of the non-swampy ground where the subsoil is composed of finer material. Above the coarser dry soils the *Empetrum* heath association dominates with an abundance of low evergreen shrubs. In wet depressions the Falkland representative of the peat bog occurs in the *Astelia* association, where several seed plants replace *Sphagnum* and forming low absorptive cushions are largely responsible for the immense layers of peat, several meters thick, that furnish the only fuel on the islands.

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[21] SKOTTSBERG, C., The vegetation in South Georgia. Wiss. Ergeb. Schwed. Südpolar. Exped. 1901–1903. **4**: Lief. 12. pp. 36. *pl. 6* and *map*. 1912.

[22] ———, Botanische Ergebnisse der schwedischen Expedition nach Patagonium und dem Feuerlande 1907–1909. III. A botanical survey of the Falkland Islands. K. Svensk. Vetensk. Handl. **50**: 129. *pl. 13* and *map*. 1913.

The tops of the highest mountains (only 700 m.) are covered with *Empetrum* heath, but a semialpine character is given to the vegetation by the presence of many cushion plants, among which the two remarkable umbelliferous genera *Bolax* and *Azorella* are conspicuous.

The author gives interesting notes on the flowering of many species, and also classifies the plants according to the "biological types" of RAUNKIAER. He points out that the results hardly support RAUNKIAER'S characterization of the islands as possessing a "chamaephyte climate," in spite of the large percentage of chamaephytes and hemicryptophytes, since both classes are evergreen in the Falklands, showing slight vegetative periodicity, simply some arrest of growth during the winter. Among the numerous other interesting facts regarding various phases of the vegetation, the presence of a very considerable number of ferns belonging to the rainy west coast of Chile and Fuegia is worthy of notice, and is made conspicuous upon the map of the author's travels.

Tierra del Fuego[23] shows the passage of the grassy heath to the steppe, a transition to deciduous forest dominated by *Nothofagus pumilio* and in higher altitudes by *N. antarctica*, while the western half is covered with an evergreen rain forest in which *N. betuloides* and *Drimys Winteri* are the chief members. The distribution of these formations is shown upon an excellent map which has been extended in a more recent publication[24] to include South America to latitude 41° S. The evergreen rain forest is shown to extend to 48° S. without striking change. Within this southern extension of rain forest, the number of species is small and the precipitation so evenly distributed that little periodicity seems to be shown. On account of the rather sudden change due to a great increase in the number of species, SKOTTSBERG has selected the parallel of 48° S. as the northern boundary of the Magellan province of the subantarctic region. North of this line, not only is the forest richer in species, but there is more periodicity on account of the more unequal distribution of the precipitation. The rain forest extends to the eastern slopes of the Andes through several valleys and usually passes by a transitional deciduous forest to the steppes of Patagonia.

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[23] SKOTTSBERG, C., Pflanzenphysiognomische Beobachtungen aus dem Feuerlande. Wiss. Ergeb. Schwed. Südpolar Exped. 1901–1903. **4**: Lief. 9. pp. 63. *pl. 3* and *map*. 1909.

[24] SKOTTSBERG, C., Botanische Ergebnisse der schwedischen Expedition nach Patagonien und dem Feuerlande 1907–1909. I. Übersicht über die wichtigsten Pflanzenformationen Südamerikas S. von 41°, ihre geographische Verbreitung und Beziehungen zum Klima. K. Svensk. Vetensk. Handl. **46**: no. 3. pp. 28. *map*. 1910.

HAUMAN-MERCK[25] has studied the northern part of this forest, and finding it quite different from the southern portion would separate the two along the parallel 46°S. into the Magellan and Valdivian forests, the latter extending to 36°S. and being distinguished by the richness of its flora as well as by the diversity of its species. At Valdivia, near the center of the area, the annual precipitation is 266 cm., well distributed. Some idea of the climate may be obtained from the fact that while peaches and grapes will not ripen, apples, plums, and potatoes grow readily, while there are also plenty of bamboos and bromeliads. While the mountainous character gives considerable diversity, the greater portion of the valleys and slopes is covered with a luxuriant evergreen forest of subtropical aspect, extremely rich in species. The different strata of the forest are well marked. Trees of the first size, 20–30 m. in height, overtopping dense stands of smaller size, represent comparatively few species, *Eucryphia cordifolia* and the largest of the evergreen beeches, *Nothofagus Dombeyi*, being most widely distributed. Quite as remarkable for their endemic character and for their local abundance are *Aextoxicum punctatum*, *Saxegothaea conspicua*, *Podocarpus nubigena*, and *Fitzroya patagonica*, the last being most important as a lumber tree. Many families are represented in the trees of second size, but none more conspicuously than the Myrtaceae, which contributes 30 species, including shrubby forms of *Eugenia*, *Myrtus*, and *Myrceugenia*. The legumes are conspicuously absent and *Drymis Winteri* is probably most abundant. The shrubs comprise many species, and like many of the trees often possess attractive flowers. Special mention should be made of the abundant bamboos, some developing the climbing habit and all belonging to the genus *Chusques*. Other climbers are fairly abundant and many, like *Hydrangea scandens*, are very beautiful when in flower. Epiphytes are abundant, but mostly limited to ferns, mosses, and lichens. At least 10 species of *Hymenophyllum* were noted. Other ferns are common among the epiphytes and dominate the herbaceous vegetation of the soil, *Blechnum*, *Dryopteris*, and *Asplenium* being prominent genera. Mosses penetrate the deepest forests, two particularly large and beautiful ones being *Polytrichum dendroide*, 30 cm. high, and *Hypopterygium Thouini*, 10 cm. high.

Of the many problems of this interesting area, the occurrence of a large deciduous beech, *Nothofagus obliqua*, in the midst of an otherwise evergreen forest, and the extension of the forest upon the eastern slopes of the Andes appear particularly fascinating. The transition of this eastern extension to the semidesert of Patagonia receives a portion of the author's attention, as does the distribution of *Librocedrus chilensis*, and the character of the alpine flora.—GEO. D. FULLER.

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[25] HAUMAN-MERCK, L., La forêt-valdivienne et ses limites. Rec. Instit. Bot. Léo Errera **9**:347–408. 1913.